Beach Replenishment

Background

New Jersey's beaches are a vital recreational resource as well as a buffer between ocean waves and landward development. Thus the State has an interest in maintaining its beaches for public recreational use and shore protection. Past reliance on structural shore protection measures, such as groins and jetties to retard the longshore transport of sand by littoral drift, and seawalls, bulkheads and revetments to prevent waves from reaching erodible materials has proven to be an inadequate and incomplete solution. Given the densely developed nature of the New Jersey oceanfront, opportunities for setbacks and other land use regulation actions are limited. Non-structural measures such as beach nourishment recognize the natural processes along the shoreline, and are therefore the preferred method for accomplishing these goals.[1]

Interest in shore protection in New Jersey began in the mid-1800's. The state's shorelines, being within easy reach of the burgeoning populations of New York City and Philadelphia, were the first to experience intense barrier-island development. Oceanfront dunes were leveled and freshwater ponds between dunes were filled to create building lots. Rapid development ensued without awareness of coastal hazards, storm vulnerability, or beach erosion. A period of intense storm and hurricane activity between 1915 and 1921, in which three hurricanes and four tropical storms passed within several nautical miles of the coasts of New Jersey and New York, highlighted the sensitivity of newly-developed shore regions to beach erosion. Soon thereafter, the first protective works ("groynes") were built to slow the erosion process. Millions of dollars were spent on uncoordinated and often inappropriate erosion-control structures that frequently produced results that were ineffective, and in some cases, counterproductive.[2] Piecemeal approaches often aggravated the problem on adjacent shorelines. The state began approaching shore protection on a regional basis within areas affected by similar coastal processes with the development of the Shore Protection Master Plan in 1981. This approach considers the potential for any one shore erosion control program to adversely affect another.

A number of programs within DEP are charged with managing coastal resources, minimizing impacts from development on these resources, such as surf clam and shorebird habitats, and minimizing development in hazard areas, including newly replenished beaches. Specifically, the Coastal Management Office administers the planning and enhancement aspects of New Jersey's federally approved Coastal Management Program. The Land Use Regulation Program, one arm of the Coastal Management Program, implements these protections through a number of different permitting programs, including the Coastal Area Facility Review Act (CAFRA) and Waterfront Development Law. In addition, the Coastal Engineering Program is responsible for overseeing beach nourishment, shore protection, flood control, and coastal dredging projects.

New Jersey's beaches play a critical role in protecting people and property from coastal storm hazards. Due to its geography, New Jersey is sometimes in the paths of hurricanes (tropical storms) and nor'easters (extratropical storms). Healthy beaches act as a buffer between the pounding surf and the homes, businesses and infrastructure along the coast. In addition, beaches provide recreation for beachgoers and fishermen and help support a multibillion dollar tourism industry.[3]

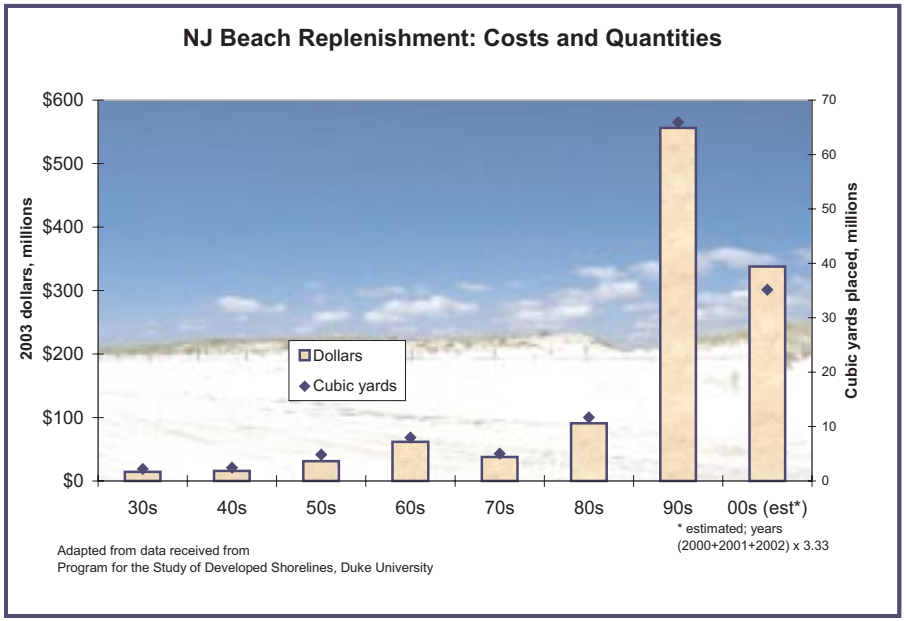
In 2003, the total impact of travel and tourism was $20 billion to the state, which accounted for 5.4 percent of the gross state product. In addition, 66 percent of each tourism dollar spent in New Jersey was retained in state, and 10 percent of the total employment in the state, 415,900 jobs, was due to travel and tourism economic activity. In 2003, tourism generated $2.9 billion in state and local government revenue, and travel and tourism generated $1.7 billion in state tax revenue. A regional breakdown of tourism shows that 44 percent of total statewide tourism expenditure occurs in Atlantic County, with the Shore Region (Monmouth and Ocean counties), and the Southern Shore Region (Cape May and Cumberland counties) contributing 17 percent and 12 percent respectively. In addition, Atlantic, Cape May, and Ocean counties are leaders in terms of tourism expenditure by county; these three counties combined contribute two-thirds of New Jersey's total tourism expenditure.[4]

Greater attention to shoreline management is becoming more important as the sea level along the New Jersey coast rises due primarily to climate change (see Climate Change in New Jersey; Trends in Temperature and Sea Level, in this Environmental Trends series). Rising seas are likely to accelerate beach erosion and coastal inundation, and will make storms and associated floods more intense, exacerbating erosion. Examination of shoreline positions along the Atlantic Ocean in New Jersey from 1836 to 1986 reveals the trend of shoreline erosion.[5] Historically, New Jersey built sea walls, groins and jetties as a defense against beach erosion. Today, in most cases, beach nourishment is

preferred to hard structures such as seawalls and bulkheads, because it has less adverse impact. Beach nourishment provides the basis for restoration of landforms and biota, and for recovery of lost environmental heritage. Dune construction is an integral component of beach nourishment, important to restoring natural beach functioning and habitat value.[6] All of these approaches are expensive, and the costs can be expected to increase as sea level rises further.

Status and Trend

Replenishment of beaches with sand pumped from bay areas and from the ocean floor began in the 1930s, and the quantities of sand placed on beaches, and the associated costs, have been cataloged since then.[7] Values for gaps in these data have been estimated by the DEP,[8] and the data are shown in the graph "NJ Beach Replenishment: Costs and Quantities."



Outlook and Implications

The cost of protecting threatened property and undeveloped coastlines from sea-level rise in the mid-Atlantic through 2100 is estimated to be in excess of $20 billion.[9] To date, approximately 65 percent of the funding for beach replenishment projects has been federal. There is some concern that less federal money will be available in the future for beach replenishment projects.

It is likely that rising sea level, coupled with the increased intensity of storms predicted by models of climate change, will result in increased flooding and beach erosion that will worsen over time. A steady increase in beach replenishment is expected in order to maintain usable beaches and provide shore protection. Increased preparedness for floods and coastal damages also will be required. Given the limited options for protecting New Jersey's shoreline, beach replenishment has so-far proven to be a viable choice, providing recreational beaches, shore protection, wildlife habitat, aesthetic value, and restoration of our coastal heritage.

More Information

www.nj.gov/dep/shoreprotection/
www.nj.gov/dep/cmp/czm_program.html
www.nap.usace.army.mil/index.htm
www.state.nj.us/commerce/Tourism.shtml

References

[1] Mauriello, Mark N., 1991, Beach Nourishment and Dredging: New Jersey's Policies, Shore & Beach 59, No. 3, July 1991, pp. 25-28.
[2] National Shoreline Study; http://www.iwr.usace.army.mil/NSMS/National%20Shoreline%20Study.pdf
[3] http://www.nj.gov/dep/shoreprotection/nourishment.htm
[4] The New Jersey Tourism Satellite Account: A Comprehensive Understanding of the Economic Contribution of Travel and Tourism in the State of New Jersey. http://www.state.nj.us/travel/industry/PDFs/NJTourismEconomy2003.pdf
[5] Farrell, S., Inglin, D., Vanazi, P., and Leatherman, S., 1985, A Summary Document for the Use and Interpretation of the Historical Shoreline Change Maps for the Sate of New Jersey, Stockton State College Coastal Research Center, 24 pp.
[6] Nordstrom, Karl F. and Mark N. Mauriello, 2001, "Restoring and Maintaining Naturally-Functioning Landforms and Biota on Intensively Developed Barrier Islands Under a No-Retreat Alternative," Shore & Beach 69, No. 3, 19-28.
[7] Coburn, Andrew, 2003; Center for the Study of Developed Shorelines, Duke University; personal communication with M. Aucott, NJDEP, November, 2003.
[8] Aucott, Michael., 2004, New Jersey DEP, Division of Science, Research, and Technology
[9] Titus, James., et al., 1991, Greenhouse Effect and Sea Level Rise: The Cost of Holding Back the Sea," Coastal Management 19, 171-204.